

Heat-Stress Risks & Exercise Guidelines

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Summertime brings a special training and racing Caution: **Heat-stress Risks.**

You want to know what to do before, during and after unusually hot/humid conditions. You want to know and follow established Exercise Guidelines that will help keep you safe while being physically active, training, and even racing in unusual conditions of heat and humidity.

Know the signs of heat stress, heat exhaustion and heat stroke. **Overheating can kill.**

Know, too, that the higher the heat-index, the slower will be your “racing pace”, and that’s normal. We’re human; we’re not super-human.

If you’re a marathoner or involved in other especially long endurance events, you’ll also want to know the signs and precautions for *hyponatremia*.

Hyponatremia, a condition of low relative blood sodium, has become a concern in long endurance events in just the last 15 years or so. Too much ingested water, or even dilute sports drinks, can kill. It has resulted in death for some over-hydrating, unaware or undisciplined marathoners, and made many more temporarily very ill. The risk of hyponatremia appears to increase with increasing ambient temperatures, but less common in cool or cold weather events. So, hyponatremia is also a hot weather concern for many marathoners and long-endurance athletes.

Our activities are for enhancing our health and fitness, not impairing them or worse. Some macho types think that more suffering in the sun, heat and humidity, even withholding from themselves fluids, is going to toughen them to the conditions. Unless you’re training for what you know will be a hot/humid race for which you need to acclimate, avoid training or hard racing in risky conditions.

Factors affecting our risk of heat illness:

1. **Metabolic rate:** Higher intensity (or speed) of exercise, the higher our core body temperature becomes over time of exercise. That’s why short sprint events in hot weather are much less risky than endurance events. One measure of metabolism is heat (calories) generated.
2. **Temperature:** Environmental temps affect the temperature gradient.
3. **Humidity:** Evaporation rate is reduced as the relative humidity rises. Therefore, the cooling effect and rate from evaporation declines, potentially to zero.
4. **Clothing:** Our clothes must not hinder the heat-loss mechanism of radiation from our skin surface. We don’t want to stop heat from being transferred from our skin surface to the environment.
5. **Fitness:** The unfit, and some special populations like children and the aged, will not be ready or able to enjoy the cooling mechanism of adequate perspiration. Some of us are not able to perspire effectively. The obese will also be less able to enjoy effective heat-loss, as they wear more naturally insulating adipose tissue like excess clothing.

6. **Hydration:** We must be able to freely perspire to enjoy the cooling effect of evaporation. **Dehydration is dangerous!**
7. **Diet, Supplements and Medications:** Know the variety of effects of foods and dietary supplements, especially herbal supplements, and medications, on your own personal ability to handle heat/humidity.
8. **Medical Risks:** General effects of aging. Alcohol or other drug abuse. Chronic illness, such as diabetes or blood-vessel disease. Recent illness involving fluid loss from vomiting or diarrhea.
9. **Acclimatization:** Some of us can train ourselves to be more tolerant of heat, by improving our physiological heat-loss mechanisms. Fit folks tend to better handle high heat than the low fit or unfit. So, train to enjoy life more and to better tolerate more of life's challenges, like hot weather conditions.

Definitions of important words and concepts:

Heat-index: combines air temperature and relative humidity to determine an apparent temperature, or how hot it actually feels. Think of it as you do a wind-chill index. High heat-index days can be health and life threatening even to the non-exerciser. Imagine how much riskier internal heat-producing aerobic endurance activities are, when one starts out in a heat-hazardous environment.

Heat Index Chart

Temp (F)	Dew Point(F)							
	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
65:	62.7	63.8	65.0	66.6				
70:	67.8	68.7	69.8	71.1	72.6			
75:	73.1	73.9	74.8	75.9	79.2	80.7		
80:	79.8	80.6	81.6	82.8	84.4	86.9	90.9	
85:	83.5	84.7	86.1	88.0	90.5	94.0	99.0	106.6
90:	87.9	89.4	91.2	93.6	96.9	101.2	107.2	115.6
95:	92.9	94.5	96.7	99.6	103.4	108.4	115.2	124.3
100:	98.1	99.9	102.4	105.6	109.8	115.3	122.7	132.3
105:	103.4	105.4	108.1	111.6	116.1	122.0	129.7	139.7
110:	108.7	110.9	113.8	117.5	122.3	128.4	136.3	146.5

Any value less than 80 is considered comfortable.
 Any value greater than 90 is considered extreme.
 Any value greater than 100 is considered hazardous.
 Any value greater than 110 is considered dangerous.

Humidity: The amount of moisture in the air. Humidity is of particular concern to aerobic exercisers whose primary cooling mechanism is perspiration evaporating. It's the evaporation of that perspiration that causes some cooling effect, not the process of perspiring itself. In other words, in water-vapor-saturated air (high humidity), there is no evaporation of perspiration, and therefore, our principle cooling mechanism is not functioning for us.

Dew point: The temperature at which a vapor begins to condense. Dew points are sometimes reported and/or used rather than relative humidity. Beware of dew points above 70.

Heat factors to account for when you're training or racing:

Temperature: Actual air temperature (You'll want to learn both reporting systems, Fahrenheit and Celsius*.)

Radiant heating: The increase in heating due to direct sunlight. Heat is transferred from the surface of one object to the surface of another with no actual physical contact.

Convective heating: The increase in heating due to wind above a certain temperature. Wind chills below freezing, and wind heats above about 72 degrees. Think of how convection ovens speed up the cooking process. Don't be a "turkey cooking" faster, and wondering why the wind on a hot day isn't cooling you. It "cooks" you.

Conductive heating: The increase in heat from contact. This would be the added heat transferred from hot pavement or macadam through your shoes to your hot feet.

Heat-reducing, or heat-loss processes, are the reverse of the above. What determines whether you're going to be heated up or cooled down is the temperature gradient, or the temperature differences between you and your environmental heating/cooling mechanisms. Add to these the processes of evaporation mentioned above, which is our main heat-loss mechanism when the temperature rises.

What to do to reduce heating and/or increase cooling effects of your hot weather training or racing:

1. **Slow down!** Reduce your pace/speed, and therefore your metabolic internal heat production.
2. **Intervals of rest and recovery** should be taken during your long duration workouts. You may want to do your shortest, high intensity speed work with ample rests/recoveries between repeats on particularly hot days, rather than do your long run.
3. **Hydrate.** Drink fluids before, during and after racing and training. 400-600 ml (about a pint or 16 fluidounces) before exercise, and about 200 ml every 15 minutes during aerobic exercise. Don't mistake dehydration for loss of fat after training or racing. One pound of fat equals 3500 calories. A marathon costs about 2500 calories from both carbohydrate and fat substrates. Drink 16 ounces of water for each pound of lost water-weight after training. If you train or race over an hour, add fluid replacement drinks (FRD's) to your training diet/

Special Note: If you're a marathoner or other long-endurance athlete...Don't over-hydrate! Avoid hyponatremia risks. The *old* marathoners rule was, "Drink, drink, drink...you can't drink too much water...drink before you're thirsty". The new standard is, "Drink when you're thirsty".

4. **Acclimate** yourself to heat/humidity gradually over at least 7-14 days. The physiological adaptations gained by acclimatization are:
 - a. an increase in blood plasma volume
 - b. an earlier onset of perspiration
 - c. an increase in perspiration rate
 - d. a reduction in lost sodium in perspiration
 - e. a reduction of blood flow to the skin (allowing that blood to carry O₂ to the working muscles instead of to the skin surface for cooling).
5. **Avoid direct sunlight.** Wear sunblock. Stay in the shade if possible. Leave the tangent on a road course for the shade when it's advisable to do so.
6. **Wear loose, high-tech, cooling fabrics and styles of skin-covering opaque clothing,** including a hat.
7. **Attend to your Heart Rate Monitor.** Train and race according to your heart rate monitor's report or your RPE (Rating of Perceived Exertion), rather than according to some predetermined pace/speed. Remember that your workload (as measured in heart rate) at the same pace/speed increases as the temperature and humidity increases, by at least 1bpm for each degree above 77F/25C.* Think of increasing heat and humidity as increasing the incline on your treadmill or roadway. Slow down! In dangerous heat/humidity conditions it's especially important to attend to how we're feeling. **It's a matter of mind with body, not mind over body.**
8. During longer races, like the marathon, you'll be offered ice. Take it and put some into your hat. I take the paper cup in which they offer the ice, and put the entire cup and ice into my hat. It really feels good, and it will help you. Ladies sometimes put a little ice into their bra tops as well. Also, since you'll be offered both fluid replacement drinks (FRD's) as well as water, use only the water over your head.
9. **Sunglasses.** No, RayBans won't cool you down, but they'll make you look cool! Let's relax, too. Actually, good UV protection of the eyes will reduce the risk of cataracts as we age, and that's cool, too.

Know and recognize in yourself and in others the signs of:

Sunburn: Redness and pain. In severe cases swelling of skin, blisters, fever and headaches.

Heat illness: A general term for problems caused by activity in high temperatures.

Heat cramps: Painful spasmodic contraction of muscles, usually abdominal or legs, caused by work in extreme heat.

Heat syncope: Fainting or sudden loss of strength due to excessive heat gain.

Heat exhaustion: Heavy perspiration, weakness, skin is cold, pale and clammy, fainting, vomiting. Normal temperature is possible. Collapse, with or without loss of consciousness, suffered in high heat/humidity, largely resulting from the loss of fluids and electrolyte imbalances (i.e. loss of sodium).

Heat stroke: Skin is hot, dry, and red (hyperpyrexia); often preceded by heat exhaustion and its symptoms, rapid heartbeat, confusion, loss of consciousness. This, the final stage in heat exhaustion, when the body is unable to lose heat, body temp above 106F occurs, and death may ensue. Consider the small range of body temperatures above normal within which we humans may survive: about 8 degrees!

Summary

Recognizing these heat illness symptoms in yourself and others may save lives. Your knowledge and prudent actions will reduce Heat Stress Risks.

Remember that the higher one's intensity of activity, the greater the energy produced, the faster one runs the more internal heat that is produced. Think of the ambient temperature conditions will feel about 20F hotter while you're training or racing. Where is that internal heat going to go if the conditions outside your body are as hot as your body or higher? Don't cook yourself to illness or worse.

Athletic training is not intentional suffering. Let's "train, don't strain".

(Coach Gary Westlund is the Founder/President of Charities Challenge, a 501(c)(3) non-profit. www.CharitiesChallenge.org, and has coached hundreds to marathons and beyond, training through Minnesota wintry cold climes and overheated, humid summers, to finish lines around the world, while benefiting many health causes.

CC Mission: To improve health and fitness, reduce health risks, and enhance disease management via goal-oriented training programs.)

* To convert Fahrenheit temperatures into Celsius:

- Begin by subtracting 32 from the Fahrenheit number.
- Divide the answer by 9.
- Then multiply that answer by 5.

Example: Change 95 degrees Fahrenheit to Celsius: 95 minus 32 is 63. Then, 63 divided by 9 is 7. Finally, 7 times 5 is 35 degrees Celsius.

To convert Celsius temperatures into Fahrenheit:

- Begin by multiplying the Celsius temperature by 9.
- Divide the answer by 5.
- Now add 32.

Example: Change 20 degrees Celsius to Fahrenheit: 20 times 9 is 180. Then 180 divided by 5 is 36. Finally, 36 plus 32 is 68 degrees Fahrenheit.